U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-274 390

Temperature Safety Device for Aquatic Laboratory Systems

Environmental Research Lab -Duluth, Minn

1977

TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)		
1. REPORT NO. EPA-600/J-77-051	2.	3. PB 274 390
4. TITLE AND SUBTITLE: Temperature Safety Device for Aquatic Laboratory Systems		5. REPORT DATE 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S): David L. DeFoe		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS: U.S. Environmental Protection Agency, Environmental Research Laboratory-Duluth, 6201 Congdon Boulevard, Duluth, Minnesota 55804		10. PROGRAM ELEMENT NO. 1BA608 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS: Same		13. TYPE OF REPORT AND PERIOD COVERED 14. SPONSORING AGENCY CODE EPA-600/03

15. SUPPLEMENTARY NOTES

Published: Progressive Fish-Culturist, Volume 39, No. 3, page 131, July 1977

16. ABSTRACT

The temperature safety device described here will protect aquatic organisms in experiments or in rearing and holding facilities by stopping water flow when set temperatures are exceeded. The device consists of switches constructed from aquarium heaters that are activated by excessively high and low temperatures.

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NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Temperature	Thermo shock	1407 - RT
Safety	Prevention	1312 - RT
Method	Life support	06 - K
Aquatic	Aquatic animals	0603 - UF
Rearing	Aquaculture	0801 - UF
Laboratory	Test chambers	1402 - UF

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
RELEASE TO PUBLIC	UNCLASSIFIED	3
	20. SECURITY CLASS (This page) UNCLASSIFIED	22. PRICE PC A01/MF A01

EPA Form 2220-1 (9-73)

PB274390

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

CINCINNATI, OHIO 45268

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cc: Evelyn P. Hunt

EPA-600/J-77-051
JOURNAL ARTICLE

Temperature Safety Device for Aquatic Laboratory Systems

Rearing and holding facilities, and aquatic bioassays represent a large investment of time and money. The successful maintenance of these facilities is often dependent on the reliability of temperature control. Malfunction of temperature-controlling systems often results in the death of test animals or in physiological stress of unknown degree. This report describes a simple, inexpensive temperature safety device that stops water flow when the temperature-controlling system fails and set temperature limits are exceeded.

The device consists of two aquarium heaters that are slightly modified to act as switches (Fig. 1). One switch breaks an electrical circuit when temperature increases, and the other breaks the circuit when temperature decreases. If either of the switches open, a normally closed solenoid valve de-energizes, stopping the flow of incoming water. The heaters are modified by removing the heating elements and joining the cut wires. After this modification, the high temperature safety device is complete. The low temperature device is additionally modified by reversing the bimetallic contact and using a small washer as a spacer.

The location of the device in the experimental system or holding facility is important; locating the device near the incoming water will result in a rapid response, which reduces the degree of temperature change. The temperature safety device should be accessible for occasional recalibration or observation. The device is calibrated by immersing it in the water at the preferred location and at the prescribed depth indicated on the heaters, and turning the adjustment knobs on both heaters until the solenoid is energized.

These switches operate at temperatures of 0 to 100°C, but perform best at 10 to 35°C. When properly placed, the device detects temperature changes in less than 1 min; it can detect changes as small as 0.5°C, but operates best with a tolerance range of 2°C or greater.

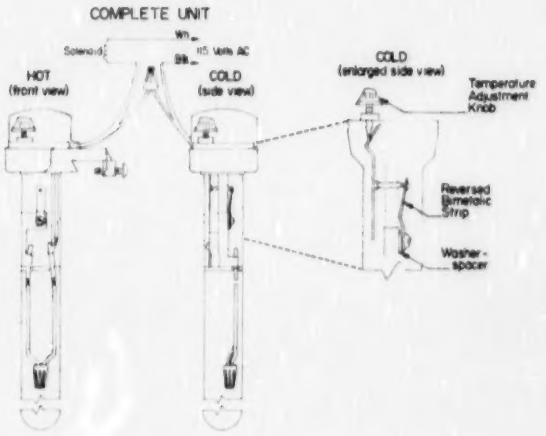

Fig. 1. Illustration of arrangement, modifications, and wiring of two aquarium heaters to provide a temperature safety device.

The heaters cost as little as $4 each, can be converted to switches in 15 min, and are readily available commercially.

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Accepted 14 February 1977